

SC111002P
patent application

providing the undoped gallium arsenide capping layer further comprises providing the undoped gallium arsenide layer with a thickness of at least six to approximately nine nanometers.

In accordance with 37 CFR § 1.121(c)(1)(ii), please find attached to this Response a separate marked-up copy of the immediately preceding rewritten claims. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE**".

REMARKS

In the April 02, 2002 Office Action, claims 1-21 are acknowledged as pending in the Application, wherein the Examiner has rejected claims 1-21. After entry of the Instant Response, claims 1, 2, and 4-21 remain pending. Support for the amendment of claims 1, 2, 16 and 19 may be found in Applicants' specification; no new matter has therefore been introduced.

As a preliminary matter, the undersigned thanks the Examiner for the courtesy of the telephone interviews conducted subsequent to the April 02, 2002 Action. As stated during the interviews, the undersigned believes all claims as amended are allowable over the art of record. In accordance with the Examiner's request, dated July 05, 2002, for Applicant to provide a separate record of the substance of these interviews, Applicants' submit the following:

Claims 1-3 and 16 were discussed. Applicants pointed out for the Examiner's consideration that the Abrokwhah '929 reference was malformed in the combinatorial syntheses corresponding to the §103(a) rejections in the pending Action. The Examiner agreed and conceded that the proper reference should have been Abrokwhah '739. When Applicants' submitted a proposed amendment to further limit the *i*-GaAs thickness range from "approximately 3 nm to 12 nm" down to "at least 6 nm to approximately 12 nm", the Examiner provisionally suggested that amendment of the claimed GaAs range to recite "at least 7 nm to approximately 12 nm" would be allowable in view of the Abrokwhah '739 disclosure of a preferred embodiment having a *i*-GaAs thickness of "less than approximately fifty angstroms" at col. 2, lines 20-24. When Applicants' asked what significance the thickness of 7 nm carried in the Examiner's consideration of provisional allowance, the Examiner was unable to identify where any clear

SC111002P
patent application

cut-off might be made. However, when this issue was further probed by Applicants', the Examiner indicated that neither 6.25 nm, 6.50 nm nor 6.75 nm would be sufficient, but that the Examiner would allow the case if Applicants amended the range to "at least 7.0 nm". Applicants' communicated their belief that such an arbitrary determination, unsubstantiated with a reasonable basis for promoting an arbitrary cut-off at 7.0 nm, would not likely be favorably reviewed by the Appeals Board. At this point, the Examiner agreed that the Board would probably not uphold his decision, but that his decision would nevertheless remain in force at this point in prosecution. Applicants' attempted to submit further argument and evidence that the Abrokwhah '739 reference only suggests operational GaAs thickness in the range of "less than approximately [5 nm]" and that Applicants' proposed range would suggest thickness in the range of at least greater than 6 nm. Applicants' also proffered argument from Jonathan Abrokwhah himself that he was not motivated to look beyond 5 nm because he didn't think it would work and the fact that it did work was an unexpected result. The Examiner remained unpersuaded and indicated that continuation of the case would not likely advance prosecution.

Claim Rejections – 35 U.S.C. §103(a)

Claims 1, 4-16, 20 and 21 stand rejected under 35 U.S.C. §103(a) as purportedly unpatentable over U.S. Patent No. 5,895,929 to Abrokwhah *et al.* The Examiner suggests that, with respect to claims 1, 4-13, 15, 16 and 20, Abrokwhah ('929) discloses a HFET with a substrate 10 of GaAs, with AlGaAs intermediate layers, with layer 16 of GaAs, delta doped layer 22, InGaAs channel layer 23, AlGaAs layer 24 and GaAs cap layer 25. The Examiner further suggests that Abrokwhah ('929) discloses a gate contact 30 having sidewalls 35 with the layer 25 partly removed. While the Examiner admits that Abrokwhah ('929) does not show layer 22 as comprising GaAs, the Examiner suggests that it would have been obvious to form layer 22 with GaAs in order to demonstrate bandgap discontinuity. The Examiner further suggests that since layer 22 is delta doped, layer 22 would have some undoped material on either face. The Examiner also proposes that implantation in the Abrokwhah ('929) disclosure is performed before layer 25 is removed. The Examiner further suggests that Kimura discloses a FET where an *i*-GaAs gate layer demonstrates width on the order of the gate contact. Finally, the Examiner proposes that it would have been obvious to apply the Kimura technique to the Abrokwhah ('929) device "for the advantage shown". As a

SC111002P
patent application

preliminary matter, Applicants are without notice and/or understanding as to what "advantage" the Examiner is referring to in the correspondence dated April 02, 2002. The Examiner makes reference to "the advantage shown", ostensibly in support of the synthetic combination of Abrokwah ('029) with the Kimura reference; however, Applicants are wholly unable to identify or otherwise ascertain any "advantage" having been demonstrated or otherwise referenced in the disclosures of either Kimura or Abrokwah ('929) – or, for that matter, in the combination of the same. Applicants would remind the Examiner that the Office "cannot simply reach conclusions based on its own understanding or experience – or on its assessment of what would be basic knowledge or common sense"; rather, the Examiner must point to some concrete evidence in the record in support the Office's findings of obviousness. *See, In Re Zurko*, 258 F.3d 1379 (2001) where the court found conclusions of obviousness lacking substantial evidentiary support to constitute reversible error on the part of the PTO.

TO THE EXTENT THAT THE ABROKWAH '929 REFERENCE WAS ERRONEOUSLY IDENTIFIED AND COMBINED WITH THE KIMURA REFERENCE, AS THE EXAMINER HAS PREVIOUSLY ADMITTED, AND INASMUCH AS THE PROPER REFERENCE SHOULD HAVE BEEN ABROKWAH '739, APPLICANTS RESPECTFULLY REQUEST THAT THE EXAMINER WITHDRAW THE FINALITY OF THE PENDING ACTION SO THAT APPLICANTS' MAY BE GIVEN FAIR PROCEDURAL OPPORTUNITY TO FORMALLY RESPOND TO THE EXAMINER'S CONCERNS AS THEY RELATE TO THE CORRECT REFERENCE.

Notwithstanding the preceding, Applicants herein respectfully traverse the rejections as applied to the erroneous Abrokwah '929 reference. In order to establish a *prima facie* case of obviousness under §103, three basic criteria must be met: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art

SC111002P
patent application

reference (or references when combined) must teach or suggest **all of the claim limitations**. (see MPEP, 2143; emphasis added). With respect to the first requirement as it relates *inter alia* to the rejection of independent claims **1 and 16**, the pending Action fails to provide a reasoned basis for the suggestion or motivation to modify or combine the disclosure of Abrokwhah ('929) with that of Kimura and/or any other teaching or reference of record. To the extent that such a suggestion or motivation has not been identified, under the second requirement, there can accordingly be no reasonable expectation of success.

Moreover, even if the Abrokwhah ('929) disclosure were combined with that of Kimura and/or any other reference, knowledge or teaching of record, such a combination would not lead a person skilled in the art to develop Applicants' invention; namely, a method of manufacturing a semiconductor component with the described layer of undoped gallium arsenide having **"a thickness of at least six to approximately twelve nanometers"**. (See claim 1 as amended; emphasis added). Accordingly, Abrokwhah ('929) taken in combination with the disclosure of Kimura fails to teach each and every limitation of Applicants' invention. Applicants therefore submit that the §103(a) rejection of independent claims **1 and 16** as amended would be improper and respectfully request that the Examiner withdraw rejection of the same.

Notwithstanding the recitation of novel elements in each of claims **4-13, 15** and **20**, inasmuch as these claims variously depend from and incorporate all of the limitations of their corresponding independent claims **1 and 16** as amended, dependent claims **4-13, 15** and **20** are similarly allowable over the art of record. Applicants therefore respectfully request that the Examiner withdraw §103(a) rejection of the same.

Notwithstanding the recitation of novel elements in claims **14** and **21**, inasmuch as these claims depend from and incorporate all of the limitations of independent claim **1** as amended and dependent claim **20** (which depends from independent claim **16** as amended), dependent claims **14** and **21** are similarly allowable over the art of record. Applicants therefore respectfully request the Examiner to withdraw §103(a) rejection of the same.

SC117002P
patent application

Notwithstanding the recitation of novel elements in claim 19, inasmuch as this claim depends from and incorporates all of the limitations of independent claims 16 as amended, dependent claim 19 is similarly allowable over Abrokwah ('929) in combination with Kimura in view of Abrokwah ('739). Applicants therefore submit that claim 19 is also in condition for allowance and respectfully request that the Examiner withdraw §103(a) rejection of the same.

Notwithstanding the recitation of novel elements in claims 17 and 18, inasmuch as these claims depend from and incorporate all of the limitations of independent claim 16 as amended, dependent claims 17 and 18 are similarly allowable over Abrokwah ('929) in view of Abrokwah ('285). Applicants therefore respectfully request the Examiner to withdraw §103(a) rejection of the same.

SC111002P
patent application**CONCLUSION**

Amendments for claims 1, 2, 16 and 19 have been presented, in compliance with 37 CFR §1.116, for the express purpose of presenting these claims in better form for consideration on Appeal inasmuch as their amendment serves to substantially reduce the number of material issues in dispute and in the hopes of promoting prosecutorial, administrative and judicial economy. Specifically, the amendments presented herein eliminate consideration as to whether the thickness of the GaAs layer may be less than 6 nm and, if presented earlier, would have substantially reduced the scope of the prior art search. Accordingly, the issues will be more clearly defined on Appeal with no requirement for further searching on the part of the Examiner.

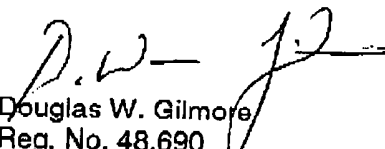
The cited references have been reviewed and are not believed to affect the patentability of claims 1, 2 and 4-21 as amended. Accordingly, reconsideration and allowance of all pending claims is earnestly requested in order to advance prosecution in the case.

No amendment made herein was related to the statutory requirements of patentability unless expressly stated; rather any amendment not so identified may be considered as directed *inter alia* to clarification of the structure and/or function of the invention and Applicants' best mode for practicing the same. Additionally, no amendment made herein was presented for the purpose of narrowing the scope of any claim, unless Applicants have argued that such amendment was made to distinguish over a particular reference or combination of references. Furthermore, no election to pursue a particular line of argument was made herein at the expense of precluding or otherwise impeding Applicants from raising alternative lines of argument later during prosecution and/or Appeal. Applicants' failure to affirmatively raise specific arguments is not intended to be construed as an admission to any particular point raised by the Examiner.

SC111002P
patent application

Should the Examiner have any questions regarding this Response or feel that a telephone call to the undersigned would be helpful to advance prosecution, the Examiner is invited to call the undersigned at the number given below.

Respectfully submitted,


Douglas W. Gilmore
Reg. No. 48,690

Dated: August 22, 2002

Motorola, Inc.
Corporate Law Department
Mail Drop 58-238
3102 North 56th Street
Phoenix, AZ 85018-6697

Douglas W. Gilmore
Attorney for Applicants
Tel 602.952.3482
doug.gilmore@motorola.com

SC111002P
patent application**VERSION WITH MARKINGS TO SHOW CHANGES MADE****In the Claims:**

In accordance with 37 CFR § 1.121(c)(1)(ii), the following separate marked-up rewritten claim versions are provided for replacement of claims 1, 2, 16 and 19:

1. (twice amended) A method of manufacturing a semiconductor component comprising:

providing a substrate with a surface;

providing a layer [comprised] comprising a thickness of at least six to approximately twelve nanometers of undoped gallium arsenide over the surface of the substrate;

forming a gate contact over a first portion of the layer; and

removing a second portion of the layer to expose a portion of the surface of the substrate, wherein the remaining first portion of said layer does not substantially extend beyond the horizontal profile of said gate contact.

2. (amended) The method of claim 1 wherein:

[providing the layer further comprises providing the layer with a thickness of approximately three to twelve nanometers] said layer comprises a thickness of at least six to approximately nine nanometers of undoped gallium arsenide.

16. (twice amended) A method of manufacturing a semiconductor component comprising:

providing a delta-doped, heteroepitaxial semiconductor substrate with a surface, the delta-doped, heteroepitaxial semiconductor substrate comprising:

a support layer comprised of semi-insulating gallium arsenide;

SC111002P
patent application

a buffer layer comprised of undoped gallium arsenide overlying the support layer;

a doping layer delta-doped with silicon and overlying the buffer layer;

a spacer layer comprised of undoped gallium arsenide and overlying the doping layer;

a channel layer comprised of indium gallium arsenide and overlying the spacer layer; and

a barrier layer comprised of aluminum gallium arsenide and overlying the channel layer, the barrier layer forming the surface for the delta-doped, heteroepitaxial semiconductor substrate;

providing an undoped gallium arsenide capping layer having a thickness of [approximately three] at least six to approximately twelve nanometers and overlying the surface of the delta-doped, heteroepitaxial semiconductor substrate;

forming a gate contact over the undoped gallium arsenide capping layer, the gate contact covering a first portion of the undoped gallium arsenide capping layer and absent over a second portion of the undoped gallium arsenide capping layer;

removing the second portion of the undoped gallium arsenide capping layer after forming the gate contact to expose a portion of the surface of the delta-doped, heteroepitaxial semiconductor substrate, wherein the remaining first portion of said undoped gallium arsenide capping layer does not substantially extend beyond the horizontal profile of said gate contact;

forming a spacer adjacent to the gate contact;

forming source and drain regions in the delta-doped, heteroepitaxial semiconductor substrate; and

forming source and drain contacts over the source and drain regions after removing the second portion of the undoped gallium arsenide capping layer.

SC111002P
patent application

19. (amended) The method of claim 16 wherein:

providing the undoped gallium arsenide capping layer further comprises providing the undoped gallium arsenide layer with a thickness of [approximately] at least six to approximately nine nanometers.